Letters to the Editor

The Board of Editors does not hold itself responsible for opinions expressed in the letter published in this section. The notes containing short reports of original investigations communicated to this section should not contain many figures and should not exceed 500 words in length. The contributions reaching the Secretary by the 15th of any month may be expected to appear in the issue for the next month. No proof will be sent to the author.

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LOW-ANGLE X-RAY MEASUREMENTS ON AIR-DRIED AND ALKALI-TREATED MACROMOLECULAR SYSTEMS-WOOL

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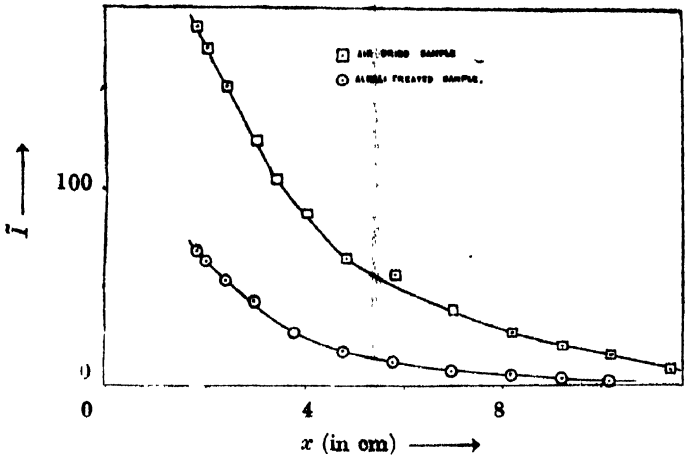
Precision measurements on alkali-treated Merino wool belonging to the macromolecular system have been made using the Low-angle Kratky (1958) camera of the latest design fitted with a crystal monochromator after Johansson (1933)-Guinier (1946). The wave length used was 1.54 Å, CuK_α radiation. The determination of parameters like the radius of gyration of cross section and the radius of gyration of thickness are made by the Guinier (1937) procedure. Such parameters on cellulose fibres have been reported much earlier by Heyn (1949) and others.

Merino wool was treated with a Sodium hydroxide solution of *p*H-10 for 40 days. The scattering curve of this sample is shown with that of the air-dried one in the figure, where $\tilde{I}$ is the smeared-out intensity and x is a function of the scattering angle θ :

$$x = 2\,ap\theta$$

a being the sample-film distance,, p the transformation factor related to the microphotometer curve i.e. the ratio of the distance in the microphotometer record to the actual distance in the photographic film, and x is the distance measured along the microphotometer record. The method of obtaining the intensity curves is the same as that reported by one of us (Ratho, 1964), except that a monochromator is used here. We have here adopted the same method for evaluation of parameters as reported earlier by us (Ratho *et al*, 1965).

From the study of the two scattering curves it appears that there is a considerable fall of intensity in the innermost region in the alkali-treated sample which is probably due to the splitting up of large sized particles into smaller ones after long treatment with alkali.



One can easily obtain the radius of gyration of cross section (R_q) and the radius of gyration of thickness (R_d) for the particles from the log $\tilde{I}x$ vrs x^2 and log $\tilde{I}x^2$ vrs x^2 curves according to Guinier approximation. The R_q, R_d, air-fraction as well as the specific surface (O/V) of the particles have been calculated and the results tabulated below :

Samples	R_q (Å)	R_d (Å)		O/V (Å^{-1})	Air-fraction
		R_{d1}	R_{d2}		
Merino Air-dried	96.99	85.53	43.37	2.082×10^{-4}	0.7018%
Merino treated with *p*H-10 NaOH solution for 40 days	83.07	76.49	38.24	4.467×10^{-5}	0.1654%

Although there is considerable fall of intensity in the low-angle regions for the alkali-treated sample due to fragmentation of larger particles to smaller ones as evidenced from R_q values, the shape of the scattering curves remain unchanged as they should have been (Kratky *et al*, 1942; Janeschitz-Kriegl *et al*, 1953.)

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MATRIX ELEMENTS INCORPORATING MOMENTUM TRANSFER

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The theoretical calculations on electron capture phenomena in ion-atom collision at high energies, should include the translatory motion (momentum trans fer) of the electron attached either with the target or the projectile ion. Different authors viz. McCarroll, (1961) and Wilets *et al*, (1966) took recourse to approximate numerical analysis to evaluate the matrix elements $<\psi^n{}_A{}^* \mid V \mid \psi^m{}_B>$ and $<\psi^n{}_A{}^* \psi^m{}_B>$ occuring as coefficients in the set of differential equations to be solved cf. Basu *et al* (1967). But the difficulty is to call for the subroutine of the intergals at every step in the process of the solution of the differential equation (see Runge—Kutta Method). Cheshire (1967) has formulated a method in which the time derivatives of the said matrix elements can be found out analytically. He has pointed out how to calculate the matrix elements for 2s and 2p states. We had also pursued the problem with a straight forward alternative derivation and obtained results identical with those of Cheshire. Further the results have been utilised in calculating some of the matrix elements in alpha-hydrogen atom collision and proton-hydrogen atom collisions.

We write the hydrogenic wave functions (unnormalised) around two moving nuclei A and B as

$$\phi_{A,B} = \exp\left[-\lambda_{A,B} r + i V_{A,B} \cdot r - \frac{i}{2} V^2{}_{A,B}\, t + \lambda_{A,}{}^2{}_B\, t \right].$$

where r_A, r_B, r refer to the position vectors of the electron from nuclei A, B or any arbitrary origin 0, and V_A, V_B the velocities of A and B. We note that

$$r_{A,B,} = r - V_{A,B}\, t - S_{A,B}$$
$$r = V_A - V_B$$
$$r = Vt + S_A - S_B.$$